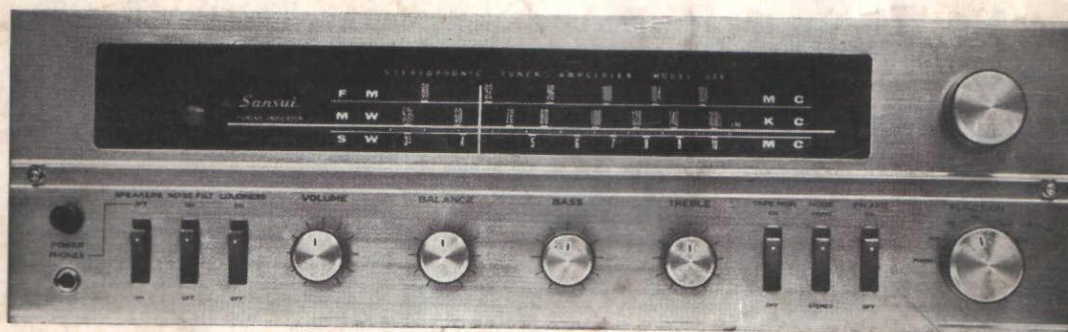


# OPERATING INSTRUCTIONS & SERVICE MANUAL

AM/FM STEREO TUNER AMPLIFIER

SANSUI 220

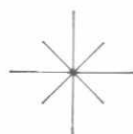


**Sansui**

SANSUI ELECTRIC COMPANY LIMITED

# SANSUI

AM/FM  
STEREO TUNER  
AMPLIFIER



# 220

Stereo sets needn't be as expensive as they're made out to be. This particular model, for instance, is priced low enough so that anyone with a taste for music can well afford it.

Still, not a bit of quality is missing. There are 22 watts to give you truly "live" sound, lots of switches for delicate tuning, and special silicon transistors in the head amplifier that completely eliminate hums and noises.

In short, this is a set you should really consider if you want to economize—especially if huge price tags in the past have kept you from enjoying the music you'd like to hear. The way the 220 looks is worth the price alone! This booklet explains the steps necessary for operating and caring for your new the 220. Read this carefully and retain for future use.

## CONTENTS

---

FEATURES .....	3
SPECIFICATIONS .....	3, 4
CHARACTERISTICS .....	4
CONNECTIONS .....	5, 6, 7, 8
SWITCHES AND CONTROLS .....	9, 10
OPERATIONS .....	11, 12
HINTS ON USE .....	13, 14, 15
SERVICE NOTE .....	16, 17, 18
PARTS LIST .....	19, 20, 21
SCHEMATIC DIAGRAM .....	22
ALIGNMENT .....	23, 24
PARTS LAYOUT .....	25
REMOVALS DISASSEMBLE .....	26
DIAL CORD STRING .....	26



# FEATURES— SPECIFICATIONS— CHARACTERISTICS

## FEATURES

### HIGH PERFORMANCE OF OUTSTANDING CHARACTERISTICS

For better performance, the 220 employs the latest push-pull connection of a super wide-band output transformer to high-performance multiunit tubes 6BM8, providing moderate music power of 22 watts. The newly designed excellent transformer helps reproduce "live" sound over the entire 35 to 15,000Hz range.

### NEW TYPE SILICON-TRANSISTOR HEAD AMPLIFIER

New type silicon transistors are used as a head amplifier to eliminate hums and noises, and to obtain better signal-to-noise ratio.

### SILICON DIODE IN POWER SECTION

The rectifying circuit has a top-quality silicon diode in place of the conventional vacuum tube to give more stability and regulation, to minimize the power loss, to solve the heat problem and lastly to assure its longer life.

### ALL HI-FI IN RADIO RECEPTION, RECORD PLAYING & TAPE RECORDING

Hi-Fi FM and AM reception, hi-fi record playing by using either crystal or magnetic cartridge, and hi-fi tape recording and playback are all yours with the 220. It is provided with a direct tape recording terminal plus a tape monitor circuit.

### CENTER CHANNEL OUTPUT TERMINAL

The 220 has an output terminal for the center channel amplifier. To obtain the 3-dimensional reproduction effect, just connect it to an additional monaural amplifier.

### FM MULTIPLEX STEREO ADAPTER TERMINAL

For FM stereo reception, the 220 is provided with

a terminal for a multiplex adapter.

### ALL NECESSARY CIRCUITS FOR HI-FI REPRODUCTION

Headphone jack for private listening. Loudness compensation at low-level listening. Tape monitor circuit that makes it possible to record and reproduce simultaneously. Built-in high-sensitivity ferrite AM antenna. Noise filter designed to eliminate noises in higher frequency range.

### FUNCTIONAL FRONT PANEL LAYOUT

For easier operation and tuning, every control knob is specially designed in both size and position.

## SPECIFICATIONS

### Audio Section

- \* Power output
  - a. Music power (IHFM): 22 watts total
  - b. RMS Power (Left/Right) 10/10 watts
  - c. RMS Stereo power (Both) 8 watts × 2
- Harmonic Distortion 1.5%
- Power Band width (IHFM) 35~15,000 Hz
- Frequency Response 30~20,000 Hz ±2 db
- Channel Separation
  - a. Phono 40 db at 1,000 Hz
  - b. AUX 1, 2 50 db at 1,000 Hz
- \* Hum and Noise (IHFH)
  - a. Phono 65 db below rated output
  - b. AUX 1, 2 70 db below rated output
- Output Impedance 8 and 16Ω
- \* Input Sensitivity (for rated output)
  - a. Phono 3 mV
  - b. AUX 1, 2 150 mV
  - c. Tape Monitor 660 mV

Recording output, center channel output  
Equalizer characteristic phono (RIAA)

### \* Controls and switches

- Bass control 50 Hz +10 db to -10 db
- Treble control 10,000 Hz +10 db to -10 db
- Loudness control 50 Hz +8 db, 10,000 Hz +8 db  
(Volume control at -30 db)
- Noise filter 10,000 Hz -10 db
- Mode switch 1. stereo 2. mono

Selector switch      1. phono   2. SW  
                           3. MW     4. FM  
                           5. AUX-1   6. AUX-2

**\* Other Special Features**

- Head Phone Jack.
- Center channel output for connection to third amplifier.
- Head phone switch.
- Recording output for tape.
- Direct tape monitor.

**FM SECTION**

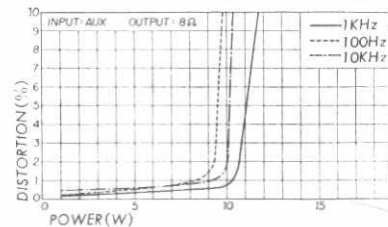
Frequency Range    88~108 MHz  
 \* Sensitivity            4.0  $\mu$ V (IHFM)  
                               2.5  $\mu$ V (S/N 20 db)  
 FM Harmonic Distortion   1.5%  
 FM Frequency Response   40~20,000 Hz  $\pm$  2 db  
 IF- Selectivity         200 KHz -3 db  
 FM Multiplex signal output for connection to multiplex adapter.

**AM SECTION**

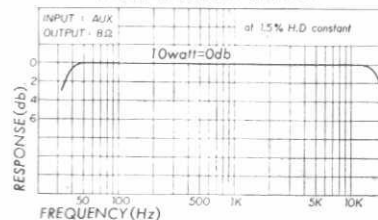
\* MW Frequency Range   535~1605 KHz  
 Sensitivity (IHFM)        30  $\mu$ V  
 IF-Selectivity             8 KHz  
 IF Frequency              455 KHz  
 \* SW Frequency Range    3.9~12 MHz  
 Sensitivity (IHFM)        40  $\mu$ V  
 \* Other Special features  
 Eye tube tuning, AFC Switch,  
 AM ferrite antenna, fly wheel tuning.  
 \* Well below SABS Specification.  
 \* Tubes, Transistors and Diodes  
 Tubes                    6BM8  $\times$  4, 6AQ8  $\times$  2, 6BE6  $\times$  1  
                               6BA6  $\times$  3, 12AX7  $\times$  1, 6E5  $\times$  1  
 Silicon transistors        2SC-402  $\times$  2  
 Silicon diodes             SE-0.5b  $\times$  2  
                                   SE-05-02  $\times$  1  
 Germanium diodes        OA-91  $\times$  3  
 \* Power Requirements  
 Power Voltage            100   117   220   240  
                                   Volts   50,   60 Hz  
 Power consumption      106 VA  
 \* Dimensions  
 Wide                    17  $\frac{3}{8}$ "  
 High                    5  $\frac{5}{32}$ " (Including rubber stand)  
 Deep                    12  $\frac{1}{32}$ " (Including knobs)  
 \* Weight                29 lbs.

**CHARACTERISTICS**

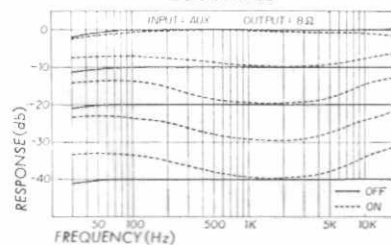
**POWER OUTPUT HARMONIC DISTORTION**



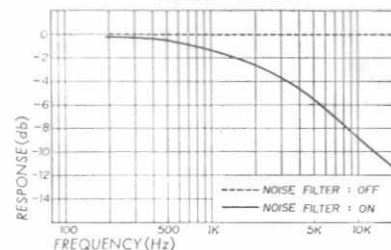
**POWER BAND WIDTH**



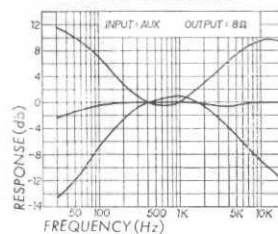
**LOUDNESS**



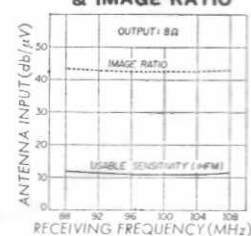
**NOISE FILTER**



**TONE CONTROL**



**FM SENSITIVITY (IHFM STANDARD) & IMAGE RATIO**



# CONNECTIONS

## ANTENNAS

### MW ANTENNA

As illustrated below, turn the ferrite bar antenna "A" on the axis "b" toward you and then, probing for a signal, orient "A" till you find the best position for it. This ferrite antenna is good enough for all "MW" receptions, except when the station signal is extremely weak due to excessively long distance from your desired station, topography, buildings etc. (Fig. 3)

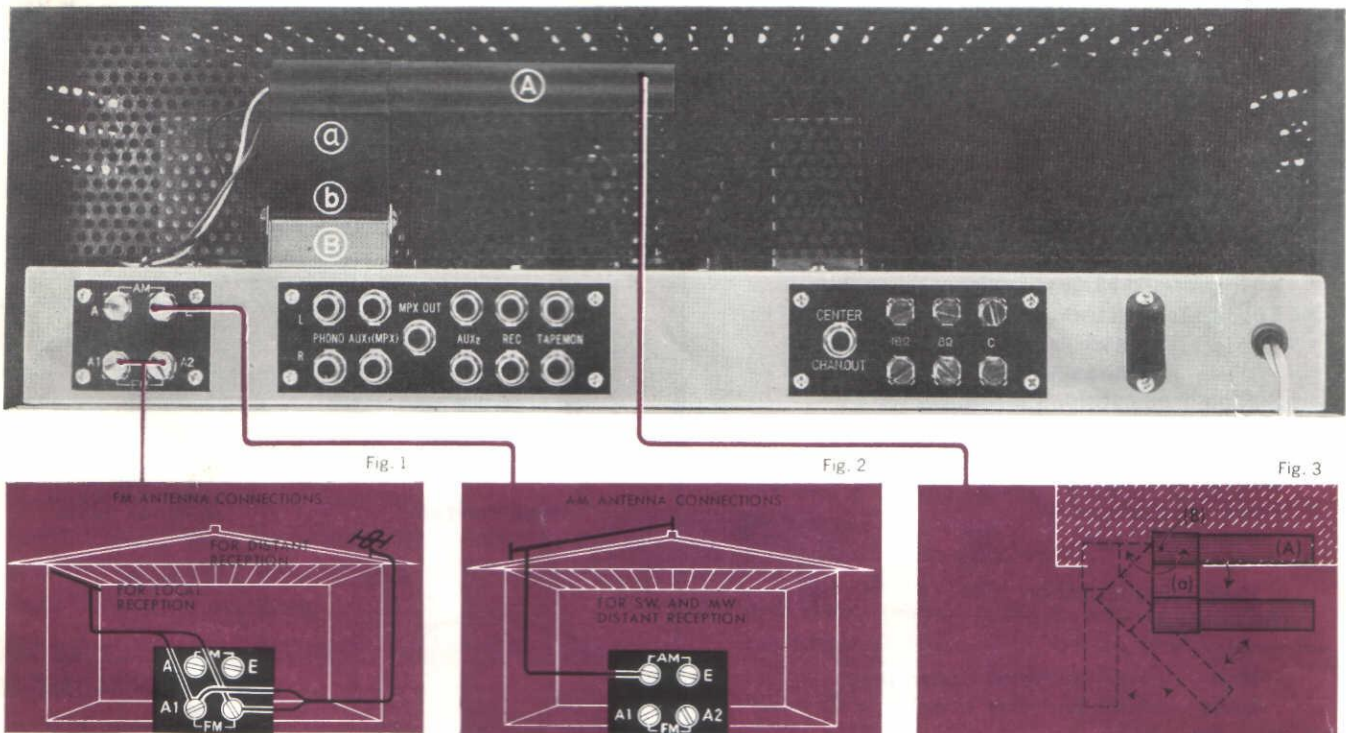
### AM ANTENNA

For the ferrite antenna inadequate to the weak MW signal and for SW radio reception, connect the AM antenna (PVC wire) to the terminal AM-A and a ground wire to AM-E. To install,

support it horizontally and apart from your building as shown in Fig. 2 and set it for the finest reception. Note that the antenna sensitivity depends largely on the position to which the antenna is installed. For safety reason, be sure to install a lightning arrester with the outdoor antenna.

### FM ANTENNA

Connect the FM antenna (feeder wire) to the terminals FM-A1 and -A2. If you live near the station or the signal is strong, put it up like "T" in your room. If you live in a thick-wall building or far away from your desired station and if the signal is too weak to receive with the indoor antenna, install the outdoor antenna like a TV receiver as shown in Fig. 1. Remember that the proper height and direction (not length) of the antenna are vital to the best reception.



# CONNECTIONS

## 2. PLAYBACK

By using shielded wire, connect the outputs of the tape recorder to the TAPE MON CHAN-L and -R terminals of the amplifier. For a monaural tape recorder, connect its output to either of the TAPE MON terminals of the amplifier.

## 3. MONITORING

To monitor the tape by the use of a 3-head tape recorder, follow the above procedures.

## FM MPX ADAPTER (FCC SYSTEM)

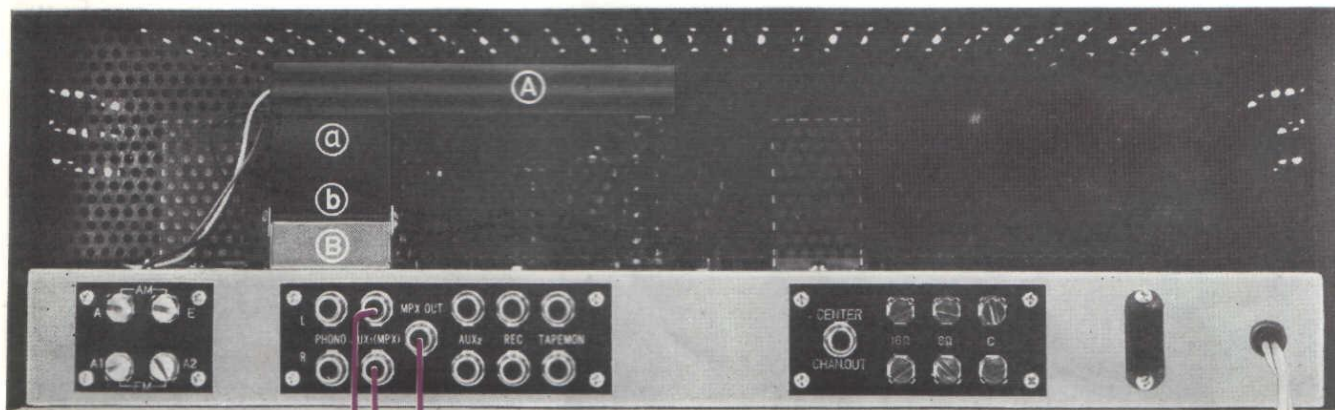
You can enjoy FM stereo broadcasts by connecting a FM MPX adapter to this amplifier.

1. Connect the input of the adapter to the terminal MPX-OUT of the amplifier.
2. Connect the output CHANNEL-L of the adapter to the terminal AUX-1 "L" of the amplifier.
3. Connect the output CHANNEL-R of the adapter to the terminal AUX-1 "R" of the amplifier.

## LOUD SPEAKERS

### STEREO

1. Connect (+) of the left speaker to the upper speaker terminal CHAN-L 8 or 16 $\Omega$  of the amplifier.
2. Connect (-) of the left speaker to the upper speaker terminal C of the amplifier.
3. Connect (+) of the right speaker to the lower



FM Multiplex adapter



speaker terminal CHAN-R 8 or 16Ω of the amplifier.

4. Connect (-) of the right speaker to the lower speaker terminal C of the amplifier.

### MONAURAL

If a 2-speaker system is used as a mono and the speaker impedance is 8 ohms, for example, connect the upper and lower 16-ohm terminals (L and R) and then of the speaker to them; connect the upper and lower C terminals (L and R) and then of the speaker to them.

**IMPORTANT:** The two speakers or groups of speakers must be properly phased. The speakers for the two channels must push the sound waves out together. If one pushes while the other pulls, there is sound cancellation at some frequencies or in some listening locations. If so, reverse the phase (+ and -) of either group of speakers.

### 3-D STEREO SYSTEM

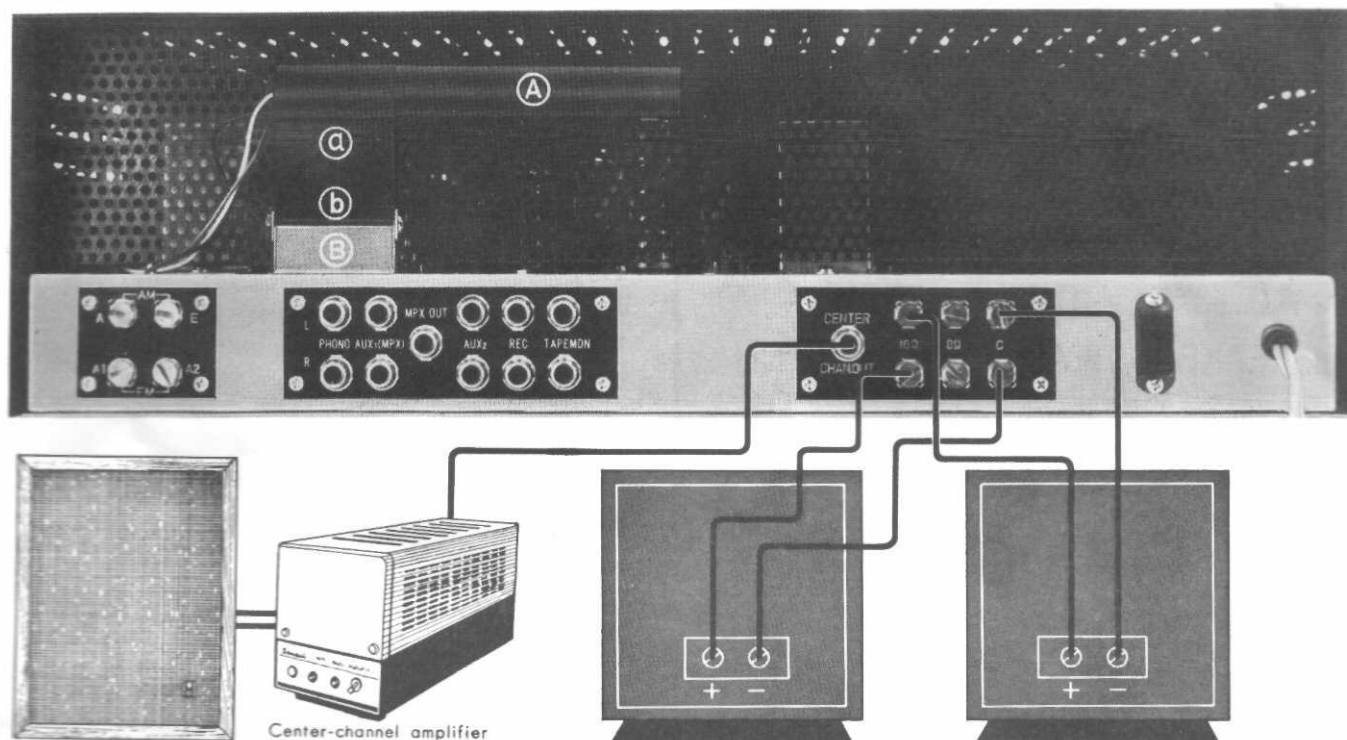
Since this amplifier is provided with an output terminal for a center channel amplifier, you can enjoy easily the 3-D stereo. By using shielded wire, connect the input of the bass amplifier \* to the pin jack of the output terminal \*\* for center channel of this amplifier; and then connect a woofer to the bass amplifier. Exclusive features and advantages of this system are the effective reproduction of the lowest tones, use of only one woofer and economy.

\*) Bass amplifier is built by using a filter circuit on the input side of the main amplifier (SANSUI Q-55 main amplifier is recommended for use).

\*\*\*) Located on the left side of the speaker terminal plate.

See diagram in the page 14.

Without the filter, mixed sounds of the right and left channels are heard from this circuit and the effect similar to the 3-D stereo system is obtained.



# SWITCHES AND CONTROLS

## ① TUNING INDICATOR (MAGIC EYE)

This indicator gives a visual indication of correct tuning. The closed fluorescent pattern means that your desired station is properly tuned in.

## ② DIAL SCALES

The upper scale indicates FM; the middle the medium-wave range and the lower the short-wave range. Turn the tuning knob to select your desired station.

## ③ TUNING KNOB

This knob is used to select your desired FM, MW or SW station.

## ④ POWER SWITCH

To switch the power on, push the button. To switch it off, push the button again. Note that this switch does not turn on and off the outlet on the back panel.

## ⑤ HEADPHONE JACK

You can enjoy stereo any time without any disturbance by just plugging in headphones. Tape monitoring is another use of the headphones. We recommend stereo dynamic headphones.

## ⑥ SPEAKERS/HEADPHONES SWITCH

After plugging in the headphones, turn this switch to PHONE; the speakers are disconnected.

## ⑦ NOISE FILTER

Turn on this switch to eliminate or reduce a record scratching noise or other noises at relatively high frequencies.

## ⑧ LOUDNESS SWITCH

This switch is used to emphasize the high and low notes only. "Live" sound is reproduced even when you enjoy a music with the volume largely reduced.

## ⑨ VOLUME CONTROL

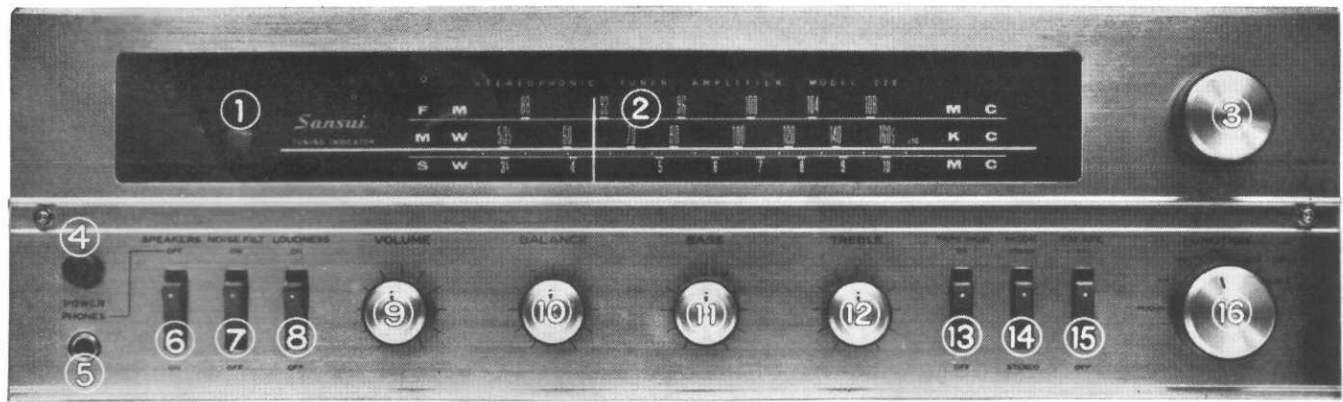
This control is used to adjust the volume of the broadcasts, record playing, tape playback etc. As it is turned clockwise, the volume is increased, or vice versa.

## ⑩ BALANCE CONTROL

This control is used to keep the volume balance proper between the two speaker groups. Adjust it so that the sound is heard equally from the right and left speakers.

## ⑪ BASS CONTROL

This control is used to adjust the sound level in bass notes. Turn it further from FLAT to right and the bass notes are more emphasized, or vice versa.



## ⑫ TREBLE CONTROL

This control is used to adjust the sound level in high notes. Turn it further from FLAT to right and the high notes are more emphasized, or vice versa.

## ⑬ TAPE MONITOR SWITCH

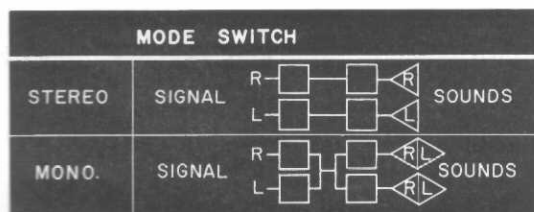
When recording on the tape by use of a 3-head tape recorder, turn on this switch to make the tape monitor circuit. The sound is recorded and reproduced at the same time.

### NOTE:

In case of playback, turn it on. Except for the above uses, it must be in OFF position.

## ⑭ MODE SWITCH (STEREO/MONO)

To enjoy FM MPX stereo broadcast, stereo record or stereo tape, set this switch to STEREO. To enjoy monaural broadcast, record or tape, set this switch to MONO. Regardless of the input signals (L and/or R), the output signals drive right and left speakers.



## ⑮ FM-AFC SWITCH

This switch is used to prevent the selected FM station from tuning off, maintaining the frequency automatically within specified limits. Be sure to turn it on after selecting your desired FM station. If one station will be affected by another station, it should be turned off.

## ⑯ FUNCTION SWITCH

This switch is used to select your desired program source:

PHONO .....Record playing;

SW .....Short-wave radio reception;

MW .....Medium-wave radio reception;

FM .....FM radio reception;

AUX-1(MPX) FM multiplex reception by use of FM MPX adapter;

AUX-2 .....Reproduction by TV or other inputs (record playing by means of a crystal cartridge).

# OPERATIONS

## RADIO RECEPTION

### A) FM RECEPTION

1. Set the FUNCTION switch to FM position.
2. Leave the MODE switch in either MONO or STEREO.
3. Select your desired station by means of the tuning knob and the magic eye.
4. Turn on the FM-AFC switch.
5. Adjust other controls and switches properly.

### B) MW RECEPTION

1. Set the FUNCTION switch to MW position.
2. Leave the MODE switch in either MONO or STEREO.
3. Select your desired station by means of the tuning knob and the magic eye.
4. Adjust other controls and switches properly.

### C) SW RECEPTION

1. Set the FUNCTION switch to SW position.
2. Leave the MODE switch in either MONO or STEREO.
3. Select your desired station by means of the tuning knob and the magic eye.
4. Adjust other controls and switches properly.

### D) FM STEREO RECEPTION (FCC SYSTEM)

1. Connect a FM MPX stereo adapter to this amplifier.

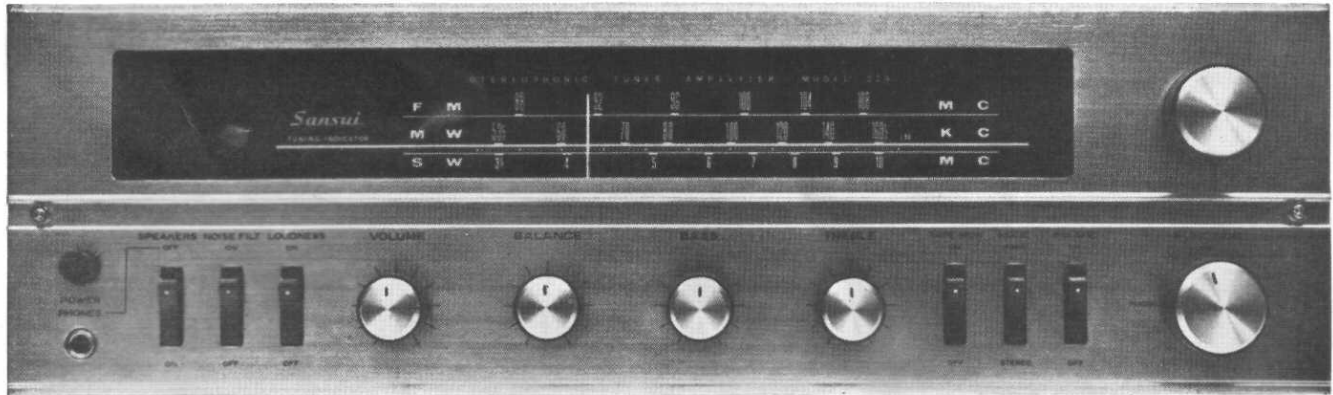
2. Set the FUNCTION switch to AUX-1 (MPX) position.
3. Set the MODE switch to STEREO position.
4. Select your desired station by means of the tuning knob and the magic eye. After tuning in the station, set on the adapter.
5. Turn on the FM-AFC switch.
6. Adjust the BALANCE control to the proper position.
7. Adjust other controls and switches properly.

## RECORD PLAYING

1. Set the FUNCTION switch to PHONO position.
2. Set the MODE switch to STEREO or MONO depending on the type of the record player.
3. Switch on the record player at correct speed (rpm).
4. Place the pickup on the record.
5. Adjust the BALANCE control to the proper position.
6. Adjust other controls and switches properly.

### NOTES:

1. To play monaural records on a stereo record player, follow the same procedures for stereo records.
2. To obtain the best balance of sound between both channels, play a monophonic record just like a stereo record and adjust the BALANCE control so that the sound is heard at a point midway between the right and left speakers.



## TAPE RECORDING AND PLAYBACK

### A) TAPE RECORDING

1. Set the FUNCTION switch to the program source which is going to be recorded.
2. Set the MODE switch to STEREO for stereo recording or to MONO for monophonic recording.
3. Set the tape recorder for recording.
4. Operate the tape recorder and adjust the controls and switches of this amplifier properly.

### B) PLAYBACK

1. Turn on the TAPE MONITOR switch.
2. Set the MODE switch to STEREO or MONO depending on the type of the tape recorder used.
3. Set the tape recorder for playback.
4. Adjust the controls and switches of this amplifier properly.

### C) MONITORING

To monitor the tape by use of a 3-head tape recorder, follow the same procedures as for playback.

#### NOTES:

1. The sound level to be recorded on the tape is not controlled by the amplifier knobs.
2. To obtain the best recording result, record on the tape through the amplifier rather than through a microphone placed in front of the speakers.

3. Before use of the tape recorder, be sure to look up the manufacturer's instructions.
4. The TAPE MONITOR switch must be in "OFF" position except for tape monitoring and playback.

# HINTS ON USE

## HOW TO ELIMINATE UNPLEASANT RADIO NOISE

### A) AM BROADCASTS

An AM radio noise is often eliminated simply by replacing the antenna.

Usually the noise is heard in the area where the station signal is too weak due to topography, buildings etc. To eliminate it, connect PVC wire to the AM antenna terminal of this amplifier and put it up on the wall of your listening room. If the noise is still heard or the sensitivity of the amplifier is still poor, an outdoor antenna should be installed.

A noise may be heard depending time, frequency, station etc. To eliminate such a noise, connect a ground wire to the amplifier or turn the power plug upside down.

### B) FM BROADCASTS

There are two trouble-sources in the FM radio noises: one is caused by the insufficient antenna input and the other is caused by other electrical appliances placed near the amplifier. The poor antenna input is due to badly installed antenna or remoteness from the station. Change the height and direction of the FM antenna (supplied). If the noise is still heard, use an indoor TV antenna or an outdoor one. When the FM antenna is used together with the TV antenna, make sure the TV picture is not affected.

Note that an excessively long antenna may rather cause a noise.

The sensitivity of the amplifier varies depending on the transmitting conditions of the sta-

tion. It happens, therefore, that one station signal is well received but the other station signal is ill received.

### C) NOISE COMMON TO FM AND AM BROADCASTS

If you live in a closely built-in area, noises may be caused by some outside factors. To eliminate, install a noise arrester with the electrical appliances or the power source of the amplifier.

### D) FM MPX STEREO

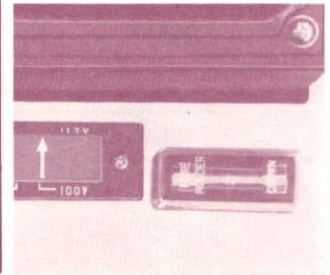
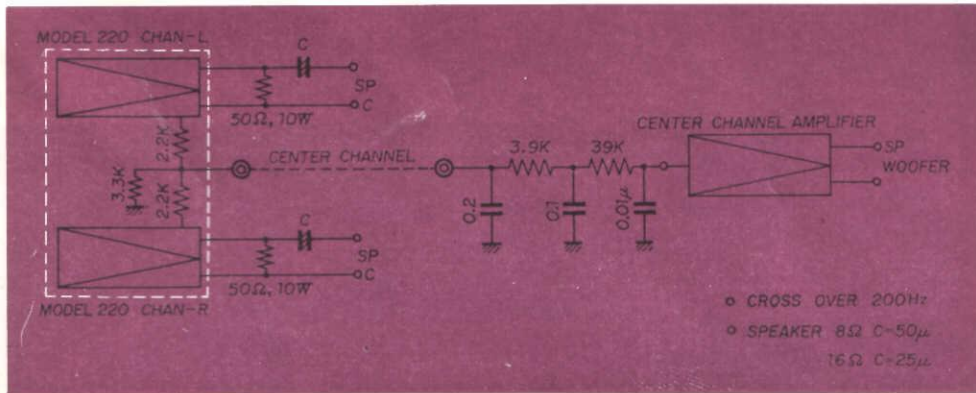
To eliminate a noise in the FM multiplex stereo, switch on the NOISE FILTER and adjust the TREBLE\* control to FLAT or turn it further to left.

## FM MPX STEREO ON MONO

You can enjoy FM MPX stereo broadcasts just like mono by setting the MODE switch to MONO and the FUNCTION switch to FM. This method is recommended if the station signal is weak and the FM MPX stereo program is impaired by noises.

## FM BROADCASTS

The FM broadcasts are characterized by more faithful reproduction of sound than the AM broadcasts. There is no noise and no jamming. One disadvantage in the FM is that the selected station is tuned off from time to time while listening. To prevent it, your the 220 possesses a built-in FM-AFC circuit. Be sure to select your desired station and then turn on the FM-AFC switch.



There are two systems in the FM MPX stereo broadcasts: FCC system (AM-FM system) and FM-FM system. Your the 220 is designed to receive the FM stereo of the FCC system.

In the FCC system, also called "single wave AM-FM system", the signal that contains the sum of the right and left stereo channels (L+R) is frequency-modulated in the main channel, while the signal that is the difference between the left and right channels (L-R) is amplitude-modulated in the sub-channel.

For easier demodulation, the FCC system employs the Compatible System of the composite signals in which a 19-KHz pilot carrier and a 67-KHz sub-signal of the SCA channel signal are added to the Main signals of L+R and L-R. This system assures clear and noiseless Hi-Fi music.

Your the 220 is designed to receive the FM stereo of the FCC system by connecting a FM Multiplexer (Sansui's the MP-2 is recommended for use, which is provided with the compatible system built within).

## 3-D STEREO SYSTEM

The 3-D stereo system has become popular in the increasing number of stereo fans. The speaker arrangement for this new system is characterized by a woofer installed at a point midway between right and left groups of tweeter/midrange speakers. This idea is based on the fact that human ears are not sensitive to the direction of sound whose frequency is less than 200 to 300 cps. Therefore, only one woofer is good enough for this system.

You can enjoy the 3-D stereo system by connecting a bass amplifier together with a woofer to the center channel terminal of this amplifier as described in Section "Connections; 3D Stereo System".

## FUSE

If the amplifier does not function at all due to the blown fuse, remove its line cord from the outlet and then replace the fuse. Use a 3-ampere cartridge fuse. Never attempt to use a wire or a fuse with improper capacity. Before replacing, be sure to trace the trouble source and repair.

## TO CONNECT TAPE RECORDER TO AMPLIFIER

To connect a tape recorder, record player etc to this amplifier, be sure to use shielded wire. The use of an ordinary cord or PVC wire may cause hum or buzz. The maximum length of the shielded wire is 1.5 meters.

## TO ELIMINATE DEEP HOWLING

Deep howling or buzzing on record playing is caused not by the amplifier, but by the record player placed on or near the speaker box. To eliminate it, keep a proper distance between them or place it on a thick cushion. Other causes may be the use of other than the shielded wire, defective connecting wire, improper connection or no grounding of the record player.

## WRONG PHASED SPEAKERS

Incorrect phasing is evidenced by loss of bass when you are listening to a monophonic record on a stereo record player at a point midway between the two speaker systems. To phase correctly, reverse wires of either speaker system.

# HINTS ON USE

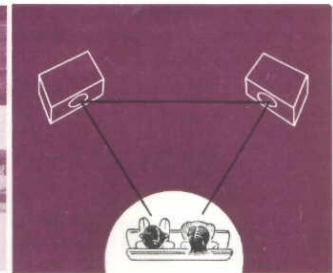
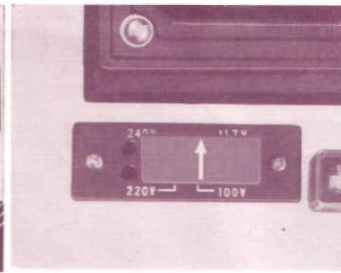
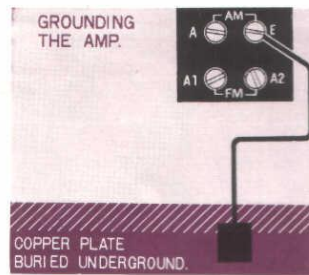


Fig. 16

## GROUNDING

Connect one end of a PVC wire or enamel wire to the E terminal of the amplifier and another end to the ground by using a copper plate as shown above. Radio noise may be reduced.

## AC OUTLET

The AC outlet on the back panel is not connected or disconnected by the power switch on the front panel. The capacity is 120VA. Be sure to use it within the limit.

## HEAT FROM THE AMP

Don't worry about the heat that is radiated from the amplifier. Air vents in the top and back plates assure you of a long continuous use. Some simple precautions should be observed: Place nothing on the amplifier. Don't install the amplifier in an air-tight box.

## CONNECTIONS MUST BE PERFECT

Lead wires must be connected correctly and firmly to the speaker outputs and inputs. Loose and/or wrong connection may cause noises and malfunction of the amplifier. Before the connection, be sure to look up manufacturer's instructions of the record player and tape recorder used.

## FOR THE BEST STEREO EFFECT

The spacing between speakers, the location of the listener, and room acoustics, all effect the performance of the stereo system.

Positioning of speakers is just as phasing in the stereo system. If the speakers are separated too much, or if the listener gets too close to the speakers, there may be a sound hole in the middle. Arrange them as illustrated in Fig. 16. The amplifier and the record player should be kept away from the speakers not only for convenience but for eliminating any troubles caused by the vibration of the reproduced sound.

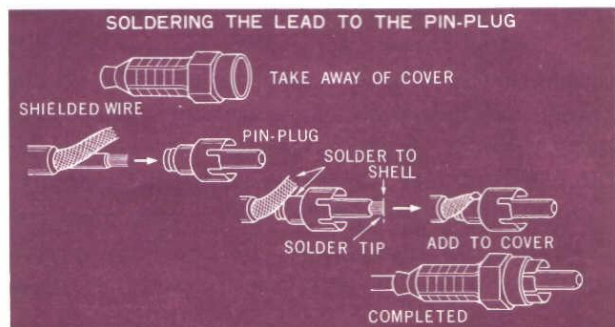
## WHERE TO BE PLACED

The amplifier should be installed to the place as given below:

1. Easy to ground;
2. Floor not vibrated;
3. Not wet and dusty;
4. Not exposed to the sun;
5. Well ventilated.

## VOLTAGE SELECTOR PLUG

The voltage selector plug allows you to use this amplifier at any of the four different supply voltages: 100, 117, 220 and 240 volts. If you'll move to the area where the supply voltage is not the same as before, pull out the plug and reset the arrow (→) marked on it to the figure of volts it the new area.





# SERVICE NOTE

When the power switch is pushed, electric supply will not be on.

Symptoms (1)	Symptoms (2)	Likely defective places
A. Poor power switch. B. poor power cord. C. poor plug contact.		Replace it. Replace it. Replace the plug contact better.
D. Blown fuse.	(In case the fuse blows again upon fitting a new one)	Replace it. Short-circuit rearing in the power transformer (T <sub>7</sub> ) or short-circuit of pass condenser (C <sub>47</sub> )

When the power switch is pushed, electric supply will be on.

Symptoms (1)	Symptoms (2)	Likely defective places
A. The amplifier does not work at all.	1. Broken wires of vacuum tube heaters 2. In case there is something wrong in the vacuum tube and voltage in resp. places 3. In case there is nothing wrong in the vacuum tube and voltage in resp. places	V <sub>1</sub> ~V <sub>12</sub> and silicon diodes. Check the places where there is something wrong in voltage. Check the input circuit after AUX.
B. Only the FM tuner does not work at all.	1. Broken wires of vacuum tube heaters in the FM system. 2. In case there is something wrong in the vacuum tube and voltage in resp. places in the FM system. 3. In case there is nothing wrong in resp. places in the FM system.	V <sub>1</sub> ~V <sub>4</sub> Check the places where there is something wrong in voltage. Insufficient capacity of C <sub>26</sub> , poor IFT (T <sub>1</sub> ~T <sub>6</sub> ) Short-circuit of C <sub>23</sub> , C <sub>24</sub> , C <sub>27</sub> , Trouble in the local oscillating circuit of V <sub>1</sub> (6AQ8)
C. Only the AM tuner does not work	1. Broken wires of vacuum tube heaters in the AM tuner system. 2. In case there is something wrong in the vacuum tube and voltage in resp. places in the AM tuner system. 3. In case there is nothing wrong in the vacuum tube and voltage in resp. places in the AM tuner system.	V <sub>2</sub> , V <sub>5</sub> Check the places where there is something wrong in voltage. Poor IFT (T <sub>3</sub> , T <sub>4</sub> ) or coil L <sub>5</sub> , L <sub>6</sub> , L <sub>7</sub> , L <sub>8</sub> . Poor diode (OA-91). Short-circuit of C <sub>14</sub> and C <sub>15</sub> . Insufficient capacity of C <sub>16</sub> .
D. The phono does not work.	1. In case of poor the TR head amplifier. 2. In case of the poor contact of the selector switch. 3. In case there is something wrong in the input circuit. 4. Poor condition of the attached appliances connected. 5. Poor coupling condenser 0.03 μF.	Replace the TR head amplifier unit. Replace it or repair the contact (S <sub>1h</sub> ~k) Poor contact and short-circuit of the input terminal and pin jack. — C <sub>60</sub> , C <sub>61</sub>
A. In case of small sounds of resp. AUX, FM, AM tuners, phono, tape recorder.	In case there is something wrong in voltage in power circuit and resp. places.	Check the places where there is something wrong in voltage.
A. In case of small sounds of AUX with nothing wrong in voltage in resp. places.	1. Poor fixed resistor. 2. Short-circuit rearing in the output transformer. 3. Drop in condenser capacity and short-circuit. 4. Deterioration of vacuum tubes.	T <sub>8</sub> , T <sub>9</sub> Insufficient capacity of C <sub>60</sub> , C <sub>61</sub> , C <sub>87</sub> , C <sub>88</sub> , C <sub>39</sub> , C <sub>90</sub> and tubular electrolytic condensers C <sub>58</sub> , C <sub>59</sub> V <sub>6</sub> ~V <sub>11</sub>
B. In case of small FM broadcasting sounds with nothing wrong in voltage in resp. places.	1. Divergence in tracking regulation. 2. Divergence in IFT regulation.	Refer to the regulation method of the FM tuner. Refer to the regulation method of the FM tuner.

# SERVICE NOTE

Symptoms ( 1 )	Symptoms ( 2 )	Likely defective places
	3. Poor diode. 4. Drop in Q of coils etc. 5. Poor condensers. 6. Poor contact of the rotary switch.	Germanium diode (OA-91) $L_1, L_4$ Insufficient capacity of $C_{13}, C_{18}, C_{21}$ , compound parts CR-1, CR-2 $S_1$
C. In case of small AM broadcasting sounds with nothing wrong in voltage resp. places.	1. Divergence in tracking regulation. 2. Divergence in IFT regulation. 3. Poor diode. 4. Drop in Q of coils etc. 5. Poor condensers. 6. Poor contact of the rotary switch.	Refer to the regulation method of the AM tuner. Refer to the regulation method of the AM tuner. OA-91 $L_5, L_6, L_7, L_8$ Insufficient capacity of $C_{35}, C_{37}, R_{26}$ compound parts CR-1 $S_{1a, d, e, f, g}$
D. In case of small sounds of the phono, recording systems with nothing wrong in voltage in resp. places.	1. In case of the poor contacts of the selector switch. 2. In case there is something wrong in the input circuit. 3. Poor condition of the attached appliances connected. 4. Poor coupling condensers. 5. Insufficient capacity of emitter bypass condensers.	$S_{1h, i, j, k}$ Poor contact of the pin jack or poor shielding wires. — $C_{49}, C_{50}, C_{55}, C_{56}$ $C_{58}, C_{59}$
A. In case the sounds from the AUX terminal are distorted much	1. Deterioration of vacuum tubes. 2. Partial short-circuit rearing in the output transformer. 3. Poor speaker. 4. Distortion resulted from the attached appliances connected.	$V_6 \sim V_{11}$ $T_8, T_9$ — —
B. In case the FM broadcasting sounds are distorted much.	1. Poor condition and small input of the antenna. 2. Divergence in tracking regulation. 3. Divergence in regulation of IFT. 4. Poor germanium diode 5. Insufficient capacity of the condensers in the FM tuner part.	Refer to the Item, ANTENNAS in this manual. Refer to the regulation method of FM. Refer to the regulation method of FM. OA-91
C. In case the AM broadcasting sounds are distorted much.	1. Divergence in tracking regulation. 2. Divergence in regulation of IFT. 3. Poor germanium diode. 4. Insufficient capacity of condenser and short circuit.	Refer to the regulation method of AM. Refer to the regulation method of AM. OA-91 Insufficient capacity of $C_{35}$ , puncture of $C_{37}$
D. In case the sounds of the phono, tape recording systems are distorted much.	1. In case of much distortion in the attached appliances connected. 2. Poor tubular electrolytic condensers.	— Puncture of $C_{49}$ and $C_{50}$
A. In case of big humming from the AUX terminal.	1. Insufficient capacity of the electrolytic condensers. 2. Inner touch of vacuum tubes. 3. Big humming in the attached appliances connected. 4. Poor regulation of the hum balancer. 5. Broken wires of the NF resistors.	$C_{79}, C_{84}, C_{91}, C_{92}$ $V_6 \sim V_{11}$ — $VR_1, VR_2,$ $R_{74}, R_{75}$

Symptoms (1)	Symptoms (2)	Likely defective places
B. In case of big humming in FM broadcasting.	<ol style="list-style-type: none"> <li>Hums generated when tuned in a channel.</li> <li>Inner touch of vacuum tubes.</li> </ol>	Reverse connection of the power plug or poor earthing condition of the chassis. V <sub>1</sub> ~V <sub>4</sub>
C. In case of big humming in AM broadcasting.	<ol style="list-style-type: none"> <li>Hums generated when tuned to a channel</li> <li>Inner touch of vacuum tubes.</li> </ol>	Reverse connection of the power plug or poor earthing condition of the chassis. V <sub>2</sub> , V <sub>5</sub>
D. In case of big humming in the phono, tape recording systems.	<ol style="list-style-type: none"> <li>Poor condition of shielding wires of sound appliances and their connection.</li> <li>Sound appliances and the shielding wires are subjected to external induction.</li> <li>Residual hums of sound appliances.</li> </ol>	Refer to the Item "HINTS ON USE" in this manual. Install them as far away as possible from the induction machines. —
A. In case of loud noises from the AUX terminal.	<ol style="list-style-type: none"> <li>Break rearing in the fixed resistor wires and touch of parts.</li> <li>Short-circuit rearing at the condensers and touch of parts.</li> <li>Break rearing in the primary side of the output transformers.</li> <li>Inner touch of vacuum tubes.</li> </ol>	R <sub>55</sub> , R <sub>56</sub> , R <sub>69</sub> , R <sub>70</sub> , R <sub>80</sub> , R <sub>81</sub> , R <sub>82</sub> , R <sub>83</sub> C <sub>82</sub> , C <sub>83</sub> , C <sub>85</sub> , C <sub>86</sub> T <sub>5</sub> , T <sub>9</sub> V <sub>6</sub> ~V <sub>11</sub>
B. In case of a great many noises in FM broadcasting.	<ol style="list-style-type: none"> <li>Small input voltage and poor condition of the antenna.</li> <li>Poor vacuum tubes (high howling)</li> <li>Break rearing in the fixed resistor wires and touching of parts.</li> <li>Short-circuit of condensers and touch of parts.</li> </ol>	Refer to the Item "ANTENNA" in this manual. V <sub>1</sub> ~V <sub>4</sub> R <sub>2</sub> , R <sub>5</sub> , R <sub>8</sub> , R <sub>12</sub> , R <sub>15</sub> , R <sub>16</sub> C <sub>2</sub> , C <sub>10</sub> , C <sub>13</sub> , C <sub>18</sub> , C <sub>21</sub>
C. In case of a great many noises in the phono, tape recording systems	<ol style="list-style-type: none"> <li>Poor condition of fixed resistors and break rearing at the resistor wires.</li> <li>poor condensers.</li> <li>Inner noises and poor connection of the attached appliances connected.</li> </ol>	R <sub>32</sub> ~R <sub>45</sub> C <sub>49</sub> ~C <sub>24</sub> —
A. While the FM tuner is working normally.	<ol style="list-style-type: none"> <li>The tuning Vacuum Tube does not work at all.</li> <li>The tuning Vacuum Tube works slightly.</li> </ol>	Poor (V <sub>12</sub> ) or broken wire of R <sub>14</sub> , R <sub>25</sub> <ul style="list-style-type: none"> <li>It varies depending on the intensity of the electric field resulted from regional differences.</li> <li>It is caused by poor condition of the FM antenna.</li> </ul>
B. While the AM tuner is working normally	<ol style="list-style-type: none"> <li>The tuning Vacuum Tube does not work at all.</li> <li>The tuning Vacuum Tube works slightly.</li> </ol>	Poor (V <sub>12</sub> ) and broken wire of R <sub>27</sub> , R <sub>28</sub> <ul style="list-style-type: none"> <li>It varies depending on the intensity of the electric field resulted from regional differences.</li> </ul>

# PARTS LIST

Part No.	Nomenclature		
R1	220 $\Omega$	$\frac{1}{4}$ Watt	10% Carbon Fixed Resistor
R2	33 K $\Omega$	$\frac{1}{4}$ Watt	10% Carbon Fixed Resistor
R3	1 M $\Omega$	$\frac{1}{4}$ Watt	10% Carbon Fixed Resistor
R4	1 M $\Omega$	$\frac{1}{4}$ Watt	10% Carbon Fixed Resistor
R5	2 K $\Omega$	$\frac{1}{4}$ Watt	10% Carbon Fixed Resistor
R6	1 K $\Omega$	$\frac{1}{4}$ Watt	10% Carbon Fixed Resistor
R7	68 $\Omega$	Enclosed in CR-1	
R8	1 K $\Omega$	$\frac{1}{2}$ Watt	10% Carbon Fixed Resistor
R9	50 K $\Omega$	$\frac{1}{4}$ Watt	10% Carbon Fixed Resistor
R10	100 K $\Omega$	$\frac{1}{4}$ Watt	10% Carbon Fixed Resistor
R11	68 $\Omega$	Enclosed in CR-1	
R12	1 K $\Omega$	$\frac{1}{2}$ Watt	10% Carbon Fixed Resistor
R13	50 K $\Omega$	Enclosed in CR-2	
R14	2.2 M $\Omega$	$\frac{1}{4}$ Watt	10% Carbon Fixed Resistor
R15	15 K $\Omega$	$\frac{1}{2}$ Watt	10% Carbon Fixed Resistor
R16	10 K $\Omega$	$\frac{1}{2}$ Watt	10% Carbon Fixed Resistor
R17	1 K $\Omega$	$\frac{1}{4}$ Watt	10% Carbon Fixed Resistor
R18	1 K $\Omega$	$\frac{1}{4}$ Watt	10% Carbon Fixed Resistor
R19	10 K $\Omega$	$\frac{1}{4}$ Watt	10% Carbon Fixed Resistor
R20	10 K $\Omega$	$\frac{1}{4}$ Watt	10% Carbon Fixed Resistor
R21	2.2 M $\Omega$	$\frac{1}{4}$ Watt	10% Carbon Fixed Resistor
R22	82 K $\Omega$	$\frac{1}{4}$ Watt	10% Carbon Fixed Resistor
R23	1 M $\Omega$	$\frac{1}{4}$ Watt	10% Carbon Fixed Resistor
R24	22 K $\Omega$	$\frac{1}{4}$ Watt	10% Carbon Fixed Resistor
R25	51 $\Omega$	$\frac{1}{4}$ Watt	10% Carbon Fixed Resistor
R26	3.3 K $\Omega$	$\frac{1}{2}$ Watt	10% Carbon Fixed Resistor
R27	2.2 M $\Omega$	$\frac{1}{4}$ Watt	10% Carbon Fixed Resistor
R28	1 M $\Omega$	$\frac{1}{2}$ Watt	10% Carbon Fixed Resistor
R29	100 K $\Omega$	$\frac{1}{2}$ Watt	10% Carbon Fixed Resistor
R30	22 K $\Omega$	$\frac{1}{2}$ Watt	10% Carbon Fixed Resistor
R31	1 K $\Omega$	$\frac{1}{2}$ Watt	10% Carbon Fixed Resistor
R32	100 K $\Omega$	$\frac{1}{4}$ Watt	10% Carbon Fixed Resistor
R33	100 K $\Omega$	$\frac{1}{4}$ Watt	10% Carbon Fixed Resistor
R34	4.7 M $\Omega$	$\frac{1}{4}$ Watt	10% Carbon Fixed Resistor
R35	4.7 M $\Omega$	$\frac{1}{4}$ Watt	10% Carbon Fixed Resistor
R36	1.5 K $\Omega$	$\frac{1}{4}$ Watt	10% Carbon Fixed Resistor
R37	1.5 K $\Omega$	$\frac{1}{4}$ Watt	10% Carbon Fixed Resistor
R38	470 K $\Omega$	$\frac{1}{4}$ Watt	10% Carbon Fixed Resistor
R39	470 K $\Omega$	$\frac{1}{4}$ Watt	10% Carbon Fixed Resistor
R40	1 M $\Omega$	$\frac{1}{2}$ Watt	10% Carbon Fixed Resistor
R41	1 M $\Omega$	$\frac{1}{2}$ Watt	10% Carbon Fixed Resistor
R42	270 K $\Omega$	$\frac{1}{4}$ Watt	10% Carbon Fixed Resistor
R43	270 K $\Omega$	$\frac{1}{4}$ Watt	10% Carbon Fixed Resistor
R44	2.2 M $\Omega$	$\frac{1}{4}$ Watt	10% Carbon Fixed Resistor
R45	2.2 M $\Omega$	$\frac{1}{4}$ Watt	10% Carbon Fixed Resistor
R46	1 M $\Omega$	$\frac{1}{4}$ Watt	10% Carbon Fixed Resistor
R47	390 K $\Omega$	$\frac{1}{4}$ Watt	10% Carbon Fixed Resistor
R48	390 K $\Omega$	$\frac{1}{4}$ Watt	10% Carbon Fixed Resistor
R49	2.2 M $\Omega$	$\frac{1}{4}$ Watt	10% Carbon Fixed Resistor

Part No.	Nomenclature		
R50	2.2 M $\Omega$	$\frac{1}{4}$ Watt	10% Carbon Fixed Resistor
R51	5.6 K $\Omega$	$\frac{1}{4}$ Watt	10% Carbon Fixed Resistor
R52	5.6 K $\Omega$	$\frac{1}{4}$ Watt	10% Carbon Fixed Resistor
R53	470 K $\Omega$	$\frac{1}{4}$ Watt	10% Carbon Fixed Resistor
R54	470 K $\Omega$	$\frac{1}{4}$ Watt	10% Carbon Fixed Resistor
R55	220 K $\Omega$	$\frac{1}{2}$ Watt	10% Carbon Fixed Resistor
R56	220 K $\Omega$	$\frac{1}{2}$ Watt	10% Carbon Fixed Resistor
R57	100 K $\Omega$	$\frac{1}{4}$ Watt	10% Carbon Fixed Resistor
R58	100 K $\Omega$	$\frac{1}{4}$ Watt	10% Carbon Fixed Resistor
R59	22 K $\Omega$	$\frac{1}{4}$ Watt	10% Carbon Fixed Resistor
R60	22 K $\Omega$	$\frac{1}{4}$ Watt	10% Carbon Fixed Resistor
R61	100 K $\Omega$	$\frac{1}{4}$ Watt	10% Carbon Fixed Resistor
R62	100 K $\Omega$	$\frac{1}{4}$ Watt	10% Carbon Fixed Resistor
R63	82 K $\Omega$	$\frac{1}{4}$ Watt	10% Carbon Fixed Resistor
R64	82 K $\Omega$	$\frac{1}{4}$ Watt	10% Carbon Fixed Resistor
R65	2.2 K $\Omega$	$\frac{1}{4}$ Watt	10% Carbon Fixed Resistor
R66	2.2 K $\Omega$	$\frac{1}{4}$ Watt	10% Carbon Fixed Resistor
R67	100 $\Omega$	$\frac{1}{4}$ Watt	10% Carbon Fixed Resistor
R68	100 $\Omega$	$\frac{1}{4}$ Watt	10% Carbon Fixed Resistor
R69	220 K $\Omega$	$\frac{1}{2}$ Watt	10% Carbon Fixed Resistor
R70	220 K $\Omega$	$\frac{1}{2}$ Watt	10% Carbon Fixed Resistor
R71	22 K $\Omega$	$\frac{1}{2}$ Watt	10% Carbon Fixed Resistor
R72	1.8 K $\Omega$	$\frac{1}{4}$ Watt	10% Carbon Fixed Resistor
R73	1.8 K $\Omega$	$\frac{1}{4}$ Watt	10% Carbon Fixed Resistor
R74	22 K $\Omega$	$\frac{1}{4}$ Watt	10% Carbon Fixed Resistor
R75	22 K $\Omega$	$\frac{1}{4}$ Watt	10% Carbon Fixed Resistor
R76	1 M $\Omega$	$\frac{1}{4}$ Watt	10% Carbon Fixed Resistor
R77	1 M $\Omega$	$\frac{1}{4}$ Watt	10% Carbon Fixed Resistor
R78	68 K $\Omega$	$\frac{1}{2}$ Watt	10% Carbon Fixed Resistor
R79	68 K $\Omega$	$\frac{1}{2}$ Watt	10% Carbon Fixed Resistor
R80	100 K $\Omega$	$\frac{1}{2}$ Watt	10% Carbon Fixed Resistor
R81	100 K $\Omega$	$\frac{1}{2}$ Watt	10% Carbon Fixed Resistor
R82	100 K $\Omega$	$\frac{1}{2}$ Watt	10% Carbon Fixed Resistor
R83	100 K $\Omega$	$\frac{1}{2}$ Watt	10% Carbon Fixed Resistor
R84	10 K $\Omega$	1Watt	10% Carbon Fixed Resistor
R85	470 K $\Omega$	$\frac{1}{4}$ Watt	10% Carbon Fixed Resistor
R86	470 K $\Omega$	$\frac{1}{4}$ Watt	10% Carbon Fixed Resistor
R87	470 K $\Omega$	$\frac{1}{4}$ Watt	10% Carbon Fixed Resistor
R88	470 K $\Omega$	$\frac{1}{4}$ Watt	10% Carbon Fixed Resistor
R89	5 K $\Omega$	1Watt	10% Carbon Fixed Resistor
R90	1.7 K $\Omega$	20Watt	Wire Wound Resistor
R91	300 $\Omega$	20Watt	Wire Wound Resistor
R92	220 $\Omega$	1Watt	10% Carbon Fixed Resistor
R93	220 $\Omega$	1Watt	10% Carbon Fixed Resistor
R94	8 $\Omega$	10Watt	Wire Wound Resistor
R95	8 $\Omega$	10Watt	Wire Wound Resistor
R96	2.2 K $\Omega$	$\frac{1}{4}$ Watt	10% Carbon Fixed Resistor
R97	2.2 K $\Omega$	$\frac{1}{4}$ Watt	10% Carbon Fixed Resistor
R98	3.3 K $\Omega$	$\frac{1}{4}$ Watt	10% Carbon Fixed Resistor

Part No.	Nomenclature			
R99	33 K $\Omega$	1/4 Watt	10%	Carbon Fixed Resistor
R100	33 K $\Omega$	1/4 Watt	10%	Carbon Fixed Resistor
R101	1 K $\Omega$	1/4 Watt	10%	Carbon Fixed Resistor
R102	1 K $\Omega$	1/4 Watt	10%	Carbon Fixed Resistor
R103	470 K $\Omega$	1/4 Watt	10%	Carbon Fixed Resistor
R104	2.2 K $\Omega$	1 Watt	10%	Carbon Fixed Resistor
R105	5.6 K $\Omega$	1/4 Watt	10%	Carbon Fixed Resistor
R106	2.2 M $\Omega$	1/4 Watt	10%	Carbon Fixed Resistor
R107	2.2 M $\Omega$	1/4 Watt	10%	Carbon Fixed Resistor
R108	5.6 K $\Omega$	1/4 Watt	10%	Carbon Fixed Resistor
R109	4.7 K $\Omega$	1/4 Watt	10%	Carbon Fixed Resistor
R110	33 $\Omega$	1/4 Watt	10%	Carbon Fixed Resistor
C1	30 pF	250 WV	10%	Ceramic tubular
C2	0.001 $\mu$ F	250 WV	+100% -0%	Ceramic tubular
C3	10 pF	250 WV	10%	Ceramic tubular
C4	12 pF	250 WV	10%	Ceramic tubular
C5	100 pF	250 WV	10%	Ceramic tubular
C6	20 pF	250 WV	10%	Ceramic tubular
C7	18 pF	250 WV	10%	Ceramic tubular
C8	5 pF	250 WV	10%	Ceramic tubular
C9	0.001 $\mu$ F	250 WV	+100% -0%	Ceramic tubular
C10	0.01 $\mu$ F	250 WV	+100% -0%	Ceramic tubular
C11	30 pF	250 WV	10%	Ceramic tubular
C12	0.01 $\mu$ F	enclosed in CR-1		
C13	0.01 $\mu$ F	250 WV	+100% -0%	Ceramic tubular
C14	100 pF	250 WV	10%	Ceramic tubular
C15	200 pF	250 WV	10%	Ceramic tubular
C16	0.01 $\mu$ F	250 WV	+100% -0%	Ceramic tubular
C17	0.01 $\mu$ F	enclosed in CR-1		
C18	0.01 $\mu$ F	250 WV	+100% -0%	Ceramic tubular
C19	40 $\mu$ F	300 WV		electrolytic tubular
C20	50 pF	enclosed in CR-2		
C21	0.01 $\mu$ F	250 WV	+100% -0%	Ceramic tubular
C22	0.002 $\mu$ F	250 WV	+100% -0%	Ceramic tubular
C23	200 pF	250 WV	10%	Ceramic tubular
C24	200 pF	250 WV	10%	Ceramic tubular
C25	5 $\mu$ F	12 WV		electrolytic tubular
C26	0.02 $\mu$ F	400 WV	10%	oil tubular
C27	0.001 $\mu$ F	250 WV	+100% -0%	Ceramic tubular
C28	0.002 $\mu$ F	250 WV	+100% -0%	Ceramic tubular
C29	0~10 pF	250 WV	10%	Ceramic tubular
C30	200 pF	250 WV	10%	Ceramic tubular
C31	0~10 pF	250 WV	10%	Ceramic tubular
C32	400 pF	500 WV	10%	Mica tubular
C33	50 pF	250 WV	10%	Ceramic tubular

Part No.	Nomenclature			
C34	2500 pF	500 WV	10%	Mica tubular
C35	0.01 $\mu$ F	250 WV	+100% -0%	Ceramic tubular
C36	0.03 $\mu$ F	400 WV	10%	oil tubular
C37	0.05 $\mu$ F	50 WV	+100% -0%	Ceramic tubular
C38	0.01 $\mu$ F	400 WV	10%	oil tubular
C39	100 $\mu$ F	170 WV		electrolytic tubular
C40	100 $\mu$ F	170 WV		electrolytic tubular
C41	0.01 $\mu$ F	400 WV	10%	oil tubular
C42	100 $\mu$ F	50 WV		electrolytic tubular
C43	0.01 $\mu$ F	250 WV	+100% -0%	Ceramic tubular
C44	0.01 $\mu$ F	250 WV	+100% -0%	Ceramic tubular
C46	0.01 $\mu$ F	250 WV	+100% -0%	Ceramic tubular
C47	0.005 $\mu$ F	600 WV	+100% -0%	oil tubular
C48	100 $\mu$ F	50 WV		electrolytic tubular
C49	5 $\mu$ F	6 WV		electrolytic tubular
C50	5 $\mu$ F	6 WV		electrolytic tubular
C51	300 pF	250 WV	10%	Mica tubular
C52	300 pF	250 WV	10%	Mica tubular
C53	0.001 $\mu$ F	50 WV	10%	Mylar tubular
C54	0.001 $\mu$ F	50 WV	10%	Mylar tubular
C55	0.1 $\mu$ F	50 WV	10%	Mylar tubular
C56	0.1 $\mu$ F	50 WV	10%	Mylar tubular
C57	{ 5 $\mu$ F	150 WV		electrolytic tubular
	{ 0.002 $\mu$ F	250 WV		Ceramic tubular
C58	30 $\mu$ F	6 WV		electrolytic tubular
C59	30 $\mu$ F	6 WV		electrolytic tubular
C60	0.03 $\mu$ F	400 WV	10%	oil tubular
C61	0.03 $\mu$ F	400 WV	10%	oil tubular
C62	150 pF	250 WV	10%	Ceramic tubular
C63	150 pF	250 WV	10%	Ceramic tubular
C64	40 pF	250 WV	10%	Ceramic tubular
C65	40 pF	250 WV	10%	Ceramic tubular
C66	0.001 $\mu$ F	400 WV	10%	oil tubular
C67	0.001 $\mu$ F	400 WV	10%	oil tubular
C68	0.005 $\mu$ F	50 WV	10%	Mylar tubular
C69	0.005 $\mu$ F	50 WV	10%	Mylar tubular
C70	0.02 $\mu$ F	50 WV	10%	Mylar tubular
C71	0.02 $\mu$ F	50 WV	10%	Mylar tubular
C72	0.001 $\mu$ F	400 WV	10%	oil tubular
C73	0.001 $\mu$ F	400 WV	10%	oil tubular
C74	180 pF	250 WV	10%	Ceramic tubular
C75	180 pF	250 WV	10%	Ceramic tubular
C76	0.005 $\mu$ F	50 WV	10%	Mylar tubular
C78	0.005 $\mu$ F	50 WV	10%	Mylar tubular
C79	20 $\mu$ F	350 WV		electrolytic Lug terminal
C80	30 $\mu$ F	6 WV		electrolytic tubular
C81	30 $\mu$ F	6 WV		electrolytic tubular
C82	250 pF	250 WV	10%	Mica tubular

# PARTS LIST

- ⊙ Trimmer attached to 4-gang variable capacitor  
○ 4 gang variable capacitor

Part No.	Nomenclature				
C83	250 pF	250 WV	10%	Mica	tubular
C84	20 $\mu$ F	350 WV		electrolytic	Lug terminal
C85	0.1 $\mu$ F	400 WV	10%	oil	tubular
C86	0.1 $\mu$ F	400 WV	10%	oil	tubular
C87	0.25 $\mu$ F	400 WV	10%	oil	MP tubular
C88	0.25 $\mu$ F	400 WV	10%	oil	MP tubular
C89	0.25 $\mu$ F	400 WV	10%	oil	MP tubular
C90	0.25 $\mu$ F	400 WV	10%		MP tubular
C91	20 $\mu$ F	350 WV		electrolytic	Lug terminal
C92	20 $\mu$ F	350 WV		electrolytic	Lug terminal
C93	200 pF	250 WV	10%	Ceramic	tubular
C94	200 pF	250 WV	10%	Ceramic	tubular
C95	0.03 $\mu$ F	400 WV	10%		tubular
C96	0.03 $\mu$ F	400 WV	10%		tubular
C97	20 $\mu$ F	300 WV		electrolytic	tubular
C98	200 pF	500 WV	10%	Mica	tubular
C99	200 pF	500 WV	10%	Mica	tubular
C100	1 pF	250 WV	$\pm 0.5\%$	Ceramic	tubular
VR-1,2	100 $\Omega$			Hum Balancer	
VR-3	20 K $\Omega$	(B)		Variable Resistor	Driver Type
VR-4,5	1 M $\Omega$	(N)		Variable Resistor	24 $\phi$ Type (Tone control)
VR-6	500 K $\Omega$	(B)		Variable Resistor	24 $\phi$ Type (Volume, Loudness Tap 250 K $\Omega$ )
VR-7	500 K $\Omega$	(BH)		Variable Resistor	24 $\phi$ Type (Balance control)
VR-8	20 K $\Omega$	(B)		Variable Resistor	Driver Type
VR-9	20 K $\Omega$	(B)		Variable Resistor	Driver Type
VR-10	20 K $\Omega$	(B)		Variable Resistor	Driver Type
VC-1	5~17 pF			Variable capacitor	(FM RF Tuning)
VC-2	5~23 pF			Variable capacitor	(FM oscillator)
VC-3	12~430 pF			Variable capacitor	(AM ANT Tuning)
VC-4	12~430 pF			Variable capacitor	(AM oscillator)
TC-1,2	8 pF			Trimmer condenser	
TC-3,4,5,6	20 pF			Trimmer condenser	
V1	6AQ8			FM, RF, OSC & mixer	
V2	6BA6			AM 2nd, FM 1st IF amp	
V3	6BA6			FM 2nd IF amp	
V4	6BA6			FM Limiter	
V5	6BE6			AM converter	
V6	12AX7			pre amp	
V7	6AQ8			Audio amp	

Part No.	Nomenclature				
V8,9,10,11	6BM8			phase inverter & power amp	
V12	6E5			Tuning indicator	
L1				FM Antenna coil	
L2				FM RF coil	
L3				FM RF choke	
L4				FM Oscillator	
L5				MW Antenna coil (420002)	
L6				SW Antenna coil	
L7				MW oscillator coil	
L8				SW oscillator coil	
L9				Heater choke	
T1				1st FM I.F.T. 10.7MHz	
T2				2nd FM I.F.T. 10.7MHz (423503)	
T3				2nd AM I.F.T. 455KHz (423004)	
T4				1st AM I.F.T. 455KHz (423003)	
T5				3rd FM I.F.T. 10.7MHz (423503)	
T6				FM Discriminator 10.7MHz (423504)	
T7				Power Transformer (400007)	
T8,9				Output transformer (410005)	(Primary 4.3 K $\Omega$ Secondary 8 $\Omega$ , 16 $\Omega$ )
2SC-402(2SC650)				Silicon Transistor (pre amp)	
SE-0.5b				Silicon diode (rectifier)	AC (rms) 420 V Id 500 mA -55°C~125°C
SE-05-02				Silicon diode (rectifier)	AC (rms) 140 V ID 500 mA -55°C~125°C
OA-91				Germanium diode (AM, FM Detector)	Vp=90V Id=50mA -55°C~75°C
1S-351				Variable capacitor (FM, AFC)	
JAC-1				Head phone jack	
PU-1				Power connector	
PL				Pilot lamp	
F				Fuse Type 6.3V 0.3A	
F				Fuse 3A	
S1				Function selector Y-4-11-6	
S2				FM AFC Switch	
S3				Mode Switch	
S4				Tape Monitor Switch	
S5				Loudness Switch	
S6				Noise Filter Switch	
S7				Speaker Switch	
PS-1				Power Switch	
CO-1				AC, Receptacle	



# ALIGNMENT

## FM ALIGNMENT PROCEDURE

1. AFC-OFF      2. Turn tuning gang fully.      Center carrier wave.      Set pointer at reference mark.

STEP	ALIGN	GENERATOR	FEED SIGNAL	OUTPUT INDICATOR	DIAL SETTING	ADJUST	ADJUST FOR
1.	IF Transformer	10.7 MHz ±400 KHz	V <sub>3</sub> Pin 1 6BA6	oscilloscope at ①		3rd IFT (T <sub>5</sub> ) Primary & secondary	Best IFT Wave form
		10.7 MHz ±400 KHz	V <sub>2</sub> Pin 1 6BA6	oscilloscope at ①		2nd IFT (T <sub>2</sub> ) Primary & secondary	Best IFT Wave form
		10.7 MHz ±400 KHz	Couple Sweep Signal by a round tube V <sub>1</sub> 6AQ8	oscilloscope at ①		1st IFT (T <sub>1</sub> ) Primary & secondary	Best IFT Wave form
2.	Discrimi- nator	10.7 MHz ±400 KHz	Couple Sweep Signal by a round tube V <sub>1</sub> 6AQ8	oscilloscope at ②		4th IFT (T <sub>6</sub> ) Discriminator Transformer	S Curve
3.	OSC.	88 MHz 400 Hz 100% Modulation	Antenna Terminals	oscilloscope & V.T.V.M. at output load	88 MHz	OSC. coil L <sub>4</sub>	Maximum
4.	OSC.	108 MHz 400 Hz 100% Modulation	Antenna Terminals	oscilloscope & V.T.V.M. at output load	108 MHz	OSC. Trimmer TC-2	Maximum
5.		Reiterate 3, 4					
6.	Antenna circuit	88 MHz 400 Hz 100% Modulation	Antenna Terminals	oscilloscope & V.T.V.M. at output load	88 MHz	Antenna coil L <sub>2</sub>	Maximum
7.	Antenna circuit	108 MHz 400 Hz 100% Modulation	Antenna Terminals	oscilloscope & V.T.V.M. at output load	108 MHz	Antenna circuit Trimmer TC-1	Maximum
8.		Reiterate 6, 7					



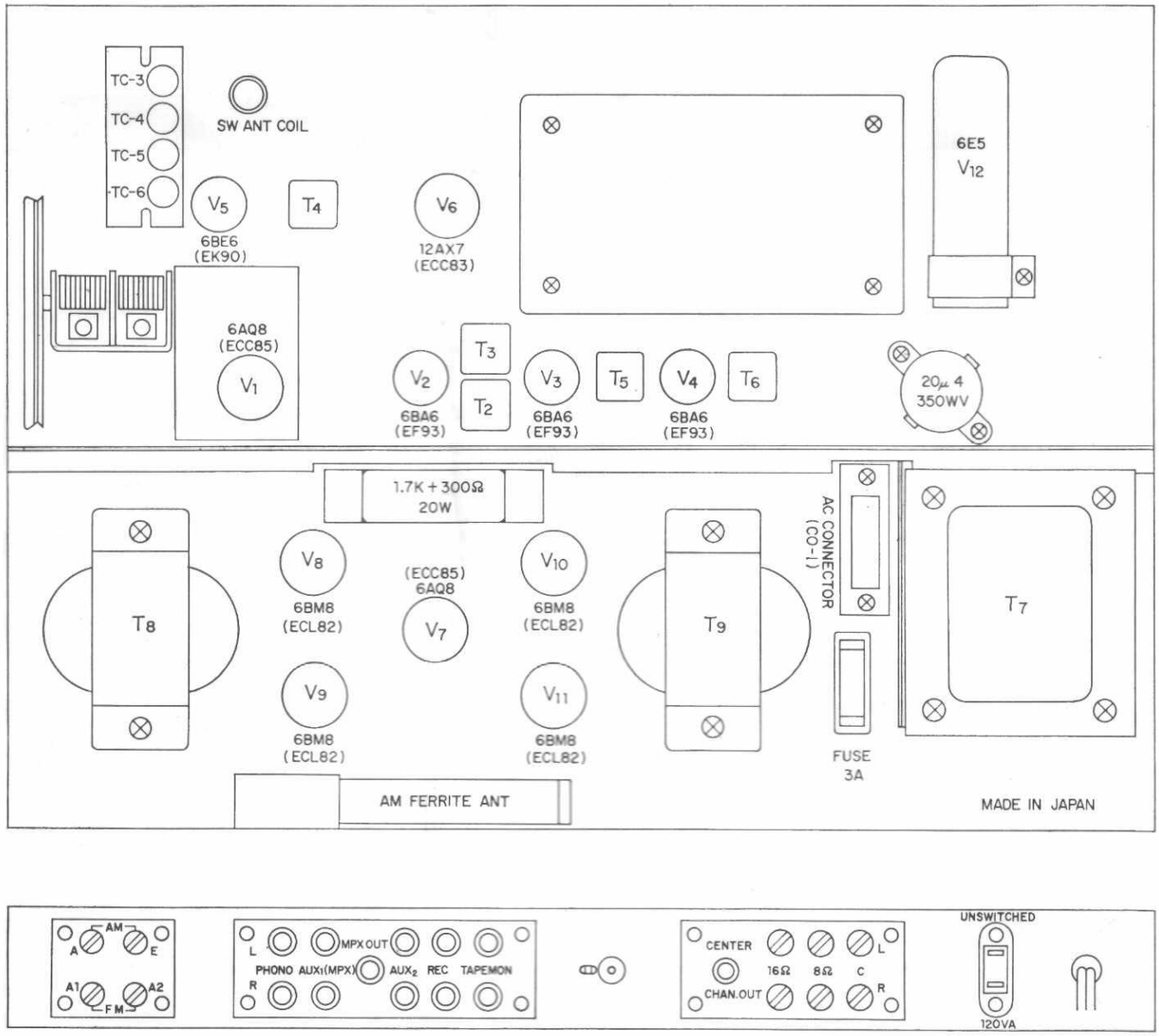
## AM ALIGNMENT PROCEDURE

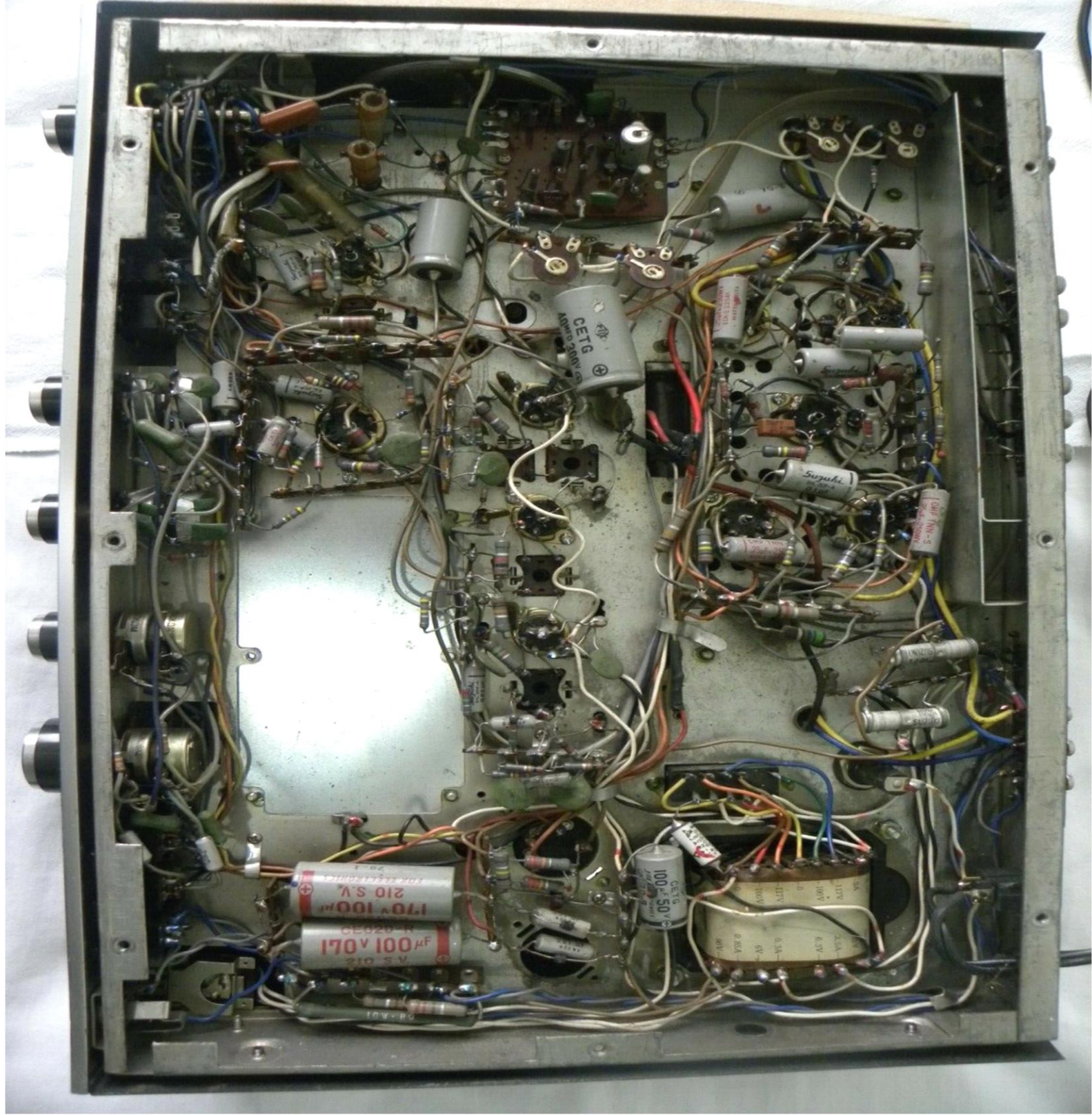
Turn tuning gang fully, Center carrier wave.

Set pointer at reference mark.

STEP	ALIGN	GENERATOR	FEED SIGNAL	OUTPUT INDICATOR	DIAL SETTING	ADJUST	ADJUST FOR
1.	IF Transformer	455 KHz ±30 KHz sweep-generator	Pin 7 6BE6	Sweep input at ③		1st I.F.T. - (T <sub>4</sub> ) Primary & secondary 2nd I.F.T. - (T <sub>8</sub> ) Primary & secondary	Best I.F.T Wave form
2.	OSC.	AM-OSCILLATOR 600 KHz 400 c/s 30% Modulation	Antenna Terminals	oscilloscope & V.T.V.M. at output load	600 KHz	OSC. coil L <sub>7</sub>	Maximum
3.	OSC.	1400 KHz 400 Hz 30% Modulation	Antenna Terminals	oscilloscope & V.T.V.M. at output load	1400 KHz	OSC. Trimmer TC-5	Maximum
4.		Reiterate 2, 3					
5.	Antenna	600 KHz 400 Hz 30% Modulation	Antenna Terminals	oscilloscope & V.T.V.M. at output load	600 KHz	Ferrite Loop Antenna at coil L <sub>5</sub>	Maximum
6.	Antenna	1400 KHz 400 Hz 30% Modulation		oscilloscope & V.T.V.M. at output load	1400 KHz	Antenna circuit at Trimmer TC-3	Maximum
7.		Reiterate 5, 6					
8.	OSC.	AM-OSCILLATOR 4 MHz 400 Hz 30% Modulation	Antenna Terminals	oscilloscope & V.T.V.M. at output load	4 MHz	OSC. coil L <sub>8</sub>	Maximum
9.	OSC.	12 MHz 400 Hz 30% Modulation	Antenna Terminals	oscilloscope & V.T.V.M. at output load	12 MHz	OSC. Trimmer TC-6	Maximum
10.		Reiterate 8, 9					
11.	Antenna circuit	4 MHz 400 Hz 30% Modulation	Antenna Terminals	oscilloscope & V.T.V.M. at output load	4 MHz	Antenna coil L <sub>6</sub>	Maximum
12.	Antenna	12 MHz 400 Hz 30% Modulation		oscilloscope & V.T.V.M. at output load	12 MHz	Antenna Trimmer TC-4	Maximum
13.		Reiterate 11, 12					

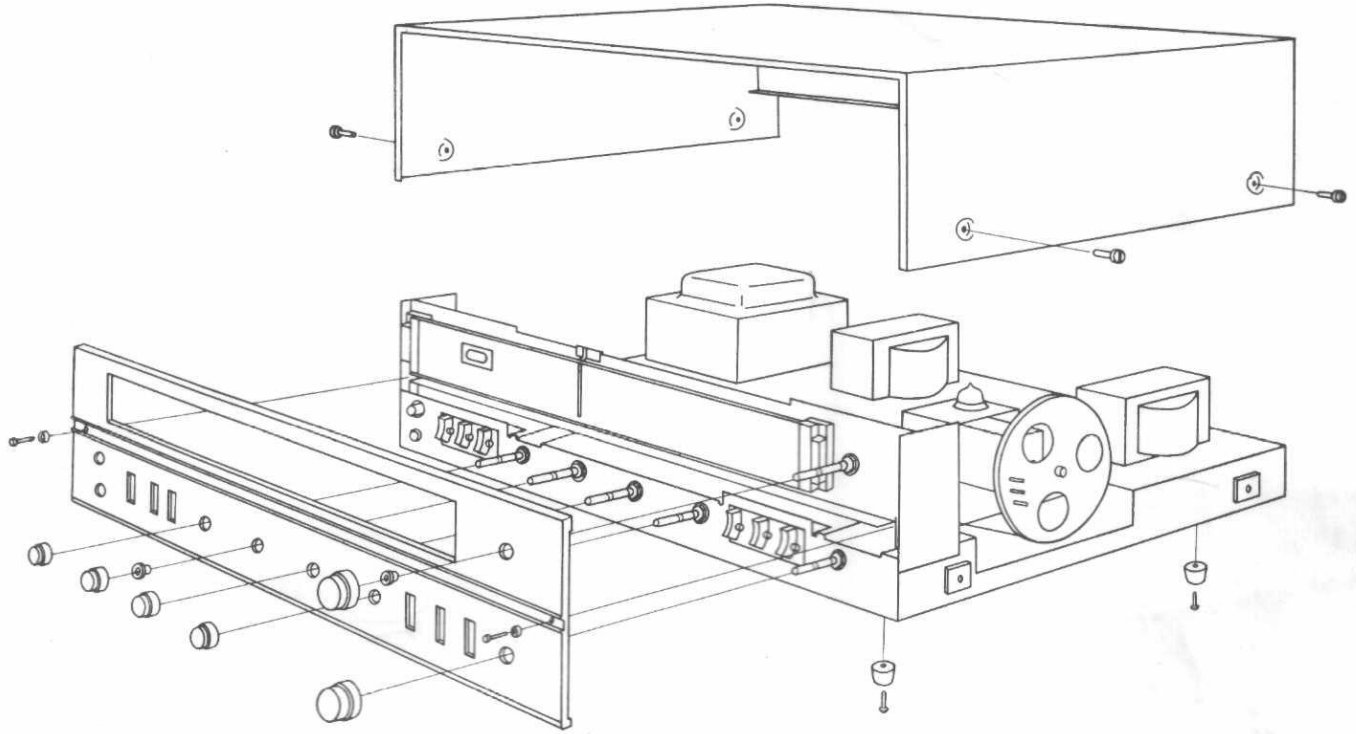
# PARTS LAYOUT





# REMOVALS DISASSEMBLE/DIAL CORD STRING

## DISASSEMBLE REMOVALS



## DIAL CORD STRING

